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13. ABSTRACT (Maximum 200 words)

Over the past year we have completed a number of studies on surface perception and visual attention. Although the two have been studied in isolation, during the latter part of our investigation, we have found some surprising relationships between the two.

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Technical Report

Over the past year we have completed a number of studies on surface perception and visual attention. Although the two have been studied in isolation, during the latter part of our investigation, we have found some surprising relationships between the two. We list our major achievements below.

1. A set of experiments demonstrating that the pattern recognition required for rapid texture segregation (He and Nakayama, 1994a) and apparent motion (He and Nakayama, 1994b) is not based on features or receptive field outputs but on perceived surface shape. Each were found, surprisingly, to be determined by amodal and modal surface completion phenomenon, not on the presumed outputs of receptive fields.
2. A set of further studies indicating the role of unpaired points in stereoscopic vision, reinforcing our conclusion that binocular stereopsis cannot be considered primarily as a binocular matching problem but of necessity is to be considered a problem in surface recovery (Shimojo and Nakayama, 1994; Anderson and Nakayama, 1994).
3. A series of studies on visual priming where by using a new method of memory kernel analysis we reveal a rich domain of unconscious implicit memory (Maljkovic and Nakayama, 94; Skavenski, McPeck, Maljkovic, and Nakayama, 1993) as revealed by both pattern recognition and eye movement latency studies.
4. A most recent series of studies providing strong evidence that our two main areas of research that we regarded as initially separate, visual attention and visual surface representation, are in fact, surprisingly related. Visual attention could not be designated to arbitrary loci in space but its deployment has an obligatory relation to perceived visual surfaces (He and Nakayama, 1994c). This we offer furthermore as a partial explanation for our earlier finding that motion correspondence is similarly bound to surfaces. Our hypothesis is that motion is tied to surfaces because attention is similarly bound.

Concluding summary: In all of these studies, the strong importance of surface perception for visual perception is outlined. This is further described a comprehensive chapter, recently completed (Nakayama, He, and Shimojo, 1994).

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Ken Nakayama - July 22, 1994

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